

REMARKS

This Amendment is in response to the non-final Office Action mailed September 30, 2002. The amendments to the specification correct minor errors. No new matter is believed to be added to the application by this Amendment.

Status of the Claims

Claims 1-17 are pending in the application. The amendments to claims 6 and 14 find support in the paragraph starting at page 7, line 23 of the specification. The amendments to claims 1 and 10 can be found in Figure 5 and at pages 6 and 7 of the specification.

Rejection Under 35 U.S.C. 112, Second Paragraph

Claims 6-8 and 14-16 are rejected under 35 U.S.C. 112, second paragraph as being indefinite. Applicant traverses.

In the Office Action, the Examiner asserts that the term "adjustable" in claims 6 and 14 is a relative term which renders the claim indefinite. However, claims 6 and 14 as amended clearly set forth that the transflective film is adjusted according to a main mode of the transflective liquid crystal display device. As a result, the claims as amended are clear, definite and have full antecedent basis. Accordingly, this rejection is overcome and withdrawal thereof is respectfully requested.

Rejection Under 35 U.S.C. 103(a) Over Kubo in View of Taiji

Claims 1-17 are rejected under 35 U.S.C. 103(a) as being obvious over Kubo (U.S. Patent No. 6,295,109 B1) in view of Taiji (JP 3228007). Applicant traverses.

The Present Invention and Its Advantages

The present invention pertains to a high-efficiency transreflective liquid crystal display that contains a liquid crystal display panel having a first transparent substrate, a second transparent substrate and a liquid crystal layer interposed between the substrates. The first transparent substrate has a color filter. The second transparent substrate has a pixel electrode and a reflector. The reflector has a light transmitting hole which the pixel electrode covers, and the light transmitting hole transmits light. The transreflective film is located outside the second transparent substrate around the location corresponding to the light transmitting hole. As shown in Figure 6, the transreflective film has a transmissive material with reflective material scattered therein. The reflective material reflects light and the transmissive material transmits light. The display device also includes a back light to supply light towards the transreflective film.

An important aspect of the invention is that the liquid crystal display device contains a pixel region that is divided into

reflective and transmissive portions, and a reflection brightness of the transflective liquid crystal display device is improved due to a first reflected light at a reflective plate of the reflective portion and a second reflected light at a transflective film of the transmissive portion. See instantly amended claims 1 and 10.

Distinctions of the Invention over Kubo and Taiji

The Examiner uses Kubo for many of the conventional components of a transflective liquid crystal display, including substrates, a liquid crystal layer, a reflector made of an opaque conductive material, a back light device, an ITO pixel electrode and a hole. The Examiner admits that Kubo fails to disclose a transflective film located outside of the second transparent substrate of the liquid crystal display panel, and that the transflective film is made from an acrylic-based resin with reflective material scattered therein.

Taiji pertains to a liquid crystal display device that includes "incorporating a reflecting material into a diffusion plate." See Abstract of Taiji. Figures 1 and 2 of Taiji show a diffusion plate 2 made of milky white acrylic resin 6, in which aluminum particles 7 are incorporated. Taiji fails to disclose or suggest a concentration of the reflective material scattered on a surface of the transflective film that is adjustable.

However, neither Kubo nor Taiji disclose or suggest a transflective liquid crystal display wherein "a pixel region is divided into reflective and transmissive portions, and a reflection brightness of the transflective liquid crystal display device is improved to a first reflected light at a reflective plate of the reflective portion and a second reflected light at a transflective portion of the transmissive portion." See claims 1 and 10.

As a result, a person having ordinary skill in the art would not be motivated by the teachings of Kubo and Taiji to produce an embodiment of the invention as is set forth in independent claims 1 and 10. Thus, the combination of Kubo and Taiji fail to assert *prima facie* obviousness. Claims dependent upon claims 1 and 10 are patentable for at least the above reasons alone.

Accordingly, this rejection is overcome and withdrawal thereof is respectfully requested.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

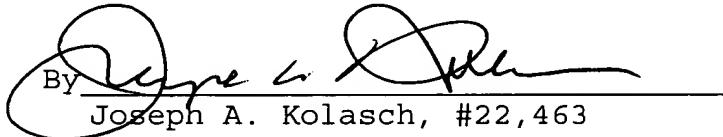
Attached hereto is a marked-up version of the changes made to the application by this Amendment.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a one (1) month extension of time for filing a reply in connection with the present application, and the required fee of \$110.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachment: Version with Markings to Show Changes Made

(Rev. 02/20/02)

VERSION WITH MARKINGS TO SHOW CHANGES MADEIN THE SPECIFICATION:

The paragraph beginning on page 6, line 17, has been amended as follows:

--Fig. 5 is a cross-sectional view illustrating a transreflective liquid crystal display device according to a preferred embodiment of the present invention. As shown in Fig. 5, a transreflective liquid crystal display device according to a preferred embodiment of the present invention includes a liquid crystal display panel and a back light device 108. The liquid crystal display panel includes lower and upper substrates 100 and 112 with a liquid crystal layer 110 interposed therebetween. The upper substrate 112 has a color filter 111, and the lower substrate 100 has a switching element (not shown), a pixel electrode 104 and a reflective electrode 102. The reflective electrode 102 is made of an opaque conductive material having a good reflectance and includes light transmitting holes 103 formed therein. The pixel electrode is made of a transparent conductive material such as indium tin oxide (ITO), and may be located on or under the light transmitting holes 103, overlapping a portion of the reflective electrode 102. The transreflective LCD device further includes a transreflective film 106 arranged between the lower substrate 100 and the back light device 108. The light transmitting holes 103 serve to transmit light 130 from the backlight device 108. The

[trnasflective] transflective LCD device further includes [a] an upper polarizer (not shown) on the upper substrate 112 and a lower polarizer (not shown) located between the lower substrate 100 and the transflective film 106.--

The paragraph beginning on page 8, line 8, has been amended as follows:

--The transflective LCD device described above is operated as follows. First, in the reflective mode, the incident light 132 from the upper substrate 112 is reflected on the reflective electrode 102 and the reflective portion 106a of the transflective film 106, and then directs toward the upper substrate 112 again. That is, since the incident light 132 from the outside is reflected on the reflective portion 106a of the [trnasflective] transflective film 106 as well as the reflective electrode 102, an aperture ratio and the light utilizing efficiency in the reflective mode are much improved.--

IN THE CLAIMS:

The claims have been amended as follows:

1. (Amended) A transflective liquid crystal display device, comprising:

a liquid crystal display panel having a first transparent substrate, a second transparent substrate, and a liquid crystal layer interposed between the first and second transparent

substrates, the first transparent substrate having a color filter, the second transparent substrate having a plurality of pixel regions, a pixel electrode and a reflector, the reflector having a light transmitting hole which the pixel electrode covers, the light transmitting hole transmitting light;

a transflective film located outside of the second transparent substrate of the liquid crystal display panel around a location corresponding to the light transmitting hole, made of a transmissive material with reflective material scattered therein, the reflective material reflecting light, the transmissive material transmitting light; and

a back light device for supplying light toward the transflective film;

wherein each pixel region is divided into reflective and transmissive portions, and a reflection brightness of the transflective liquid crystal display device is improved due to a first reflected light at the reflector of the reflective portion and a second reflected light at the transflective film of the transmissive portion.

6. (Amended) The transflective liquid crystal display device of claim 1, wherein a concentration of the reflective material scattered on a surface of the transflective film is [adjustable] adjusted according to a main mode of the transflective liquid crystal display device.

10. (Amended) A transflective liquid crystal display device, comprising:

a liquid crystal display panel having a first transparent substrate, a second transparent substrate, and a liquid crystal layer interposed between the first and second transparent substrates, the first transparent substrate having a color filter, the second transparent substrate having a plurality of pixel regions, a pixel electrode and a reflector, the reflector having a light transmitting hole which the pixel electrode covers, the light transmitting hole transmitting light;

a transflective film located outside of the second transparent substrate of the liquid crystal display panel around a location corresponding to the light transmitting hole, made of an acrylic-resin based transmissive material with reflective material scattered therein, the reflective material reflecting light, the transmissive material transmitting light; and

a back light device for supplying light toward the transflective film;

wherein each pixel region is divided into reflective and transmissive portions, and a reflection brightness of the transflective liquid crystal display device is improved due to a first reflected light at the reflector of the reflective portion and a second reflected light at the transflective film of the transmissive portion.

14. (Amended) The transflective liquid crystal display device of claim 10, wherein a concentration of the reflective material scattered on a surface of the transflective film is [adjustable] adjusted according to a main mode of the transflective liquid crystal display device.